General

Guideline Title

ACR Appropriateness Criteria® hemoptysis.

Bibliographic Source(s)

Ketai LH, Kirsch J, Kanne JP, Chung JH, Donnelly EF, Ginsburg ME, Heitkamp DE, Henry TS, Kazerooni EA, Lorenz JM, McComb BL, Ravenel JG, Saleh AG, Shah RD, Steiner RM, Suh RD, Mohammed TLH, Expert Panel on Thoracic Imaging. ACR Appropriateness CriteriaÂ® hemoptysis [online publication]. Reston (VA): American College of Radiology (ACR); 2014. 7 p. [32 references]

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Jeudy J, Khan AR, Mohammed TL, Amorosa JK, Brown K, Dyer DS, Gurney JW, MacMahon H, Saleh AG, Vydareny KH, Expert Panel on Thoracic Imaging. ACR Appropriateness Criteria® hemoptysis. [online publication]. Reston (VA): American College of Radiology (ACR); 2010. 5 p. [21 references]

Recommendations

Major Recommendations

ACR Appropriateness Criteria®

Clinical Condition: Hemoptysis

Variant 1: Hemoptysis ≥30 cc OR 2 risk factors (>40 years old and >30 pack-year history).

Radiologic Procedure	Rating	Comments	RRL*
X-ray chest	9		
CTA chest with contrast	8		
CT chest without contrast	4,5,6 May be appropriate; 7,8,9 Usually appropriate	Consider this procedure if there is a contraindication to iodinated contrast.	

Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate

*Relative Radiation Level

Radiologic Procedure	Rating	Comments	RRL*
Arteriography bronchial with or without embolization	9	For patients with a preprocedure diagnosis that carries a high risk for recurrent hemorrhage.	Varies
Arteriography pulmonary	2	Consider this procedure for therapy.	
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 2: Persistent/recurrent hemoptysis (<30 cc) and one risk factor (>40 years old, >30 pack-year history).

Radiologic Procedure	Rating	Comments	RRL*
X-ray chest	9		
CTA chest with contrast	8		
CT chest without contrast	6	Consider this procedure if there is a contraindication to iodinated contrast.	
Arteriography pulmonary	2		
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 3: Massive hemoptysis without cardiopulmonary compromise.

Radiologic Procedure	Rating	Comments	RRL*
X-ray chest	9		
Arteriography bronchial with or without embolization	8		Varies
CTA chest with contrast	8		
Arteriography pulmonary	5		
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Radiologic Procedure	Rating	Comments	RRL*
CT chest without contrast	5		
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Summary of Literature Review

Introduction/Background

Hemoptysis is defined as the expectoration of blood that originates from the tracheobronchial tree or pulmonary parenchyma. Life-threatening hemoptysis is rare. Most cases are benign, self-limiting events. However, the presentation of hemoptysis may be a harbinger of significant underlying tracheopulmonary pathology. Common causes of hemoptysis include chronic bronchitis, bronchiectasis, pneumonia, fungal infections, tuberculosis, and malignancy. Rarely hemoptysis can be caused by pulmonary vasculitis.

Various categorizations of hemoptysis severity have been proposed. In general terms, classification systems consider <30 cc of hemoptysis minor, 30–300 cc moderate to severe, and >300-400 cc of expectorated blood in 24 hours as massive hemoptysis. The source of bleeding is usually from erosion of systemic rather than pulmonary arteries. Notable exceptions are arteriovenous malformations and pulmonary artery aneurysms.

The majority of patients will have an identifiable source and etiology for the bleeding at the time of initial evaluation. In many series, bronchitis is considered a definitive etiology of hemoptysis despite its diagnosis being based on bronchoscopic findings that may be nonspecific. Cryptogenic hemoptysis, for which no cause can be identified, is responsible for 3.0% to 2.2% of episodes of hemoptysis. Most recent studies consider cryptogenic hemoptysis to be present if both bronchoscopy and initial computed tomography (CT) are nondiagnostic and place this rate at approximately 10% to 20%.

Bronchoscopy versus Computed Tomography

There is controversy in the literature regarding the use of CT versus bronchoscopy when further study is indicated. This controversy is further compounded by the lack of a consistent clinical approach for evaluating patients with hemoptysis. Bronchoscopy, performed with either a rigid or a flexible fiberoptic endoscope, is useful in identifying a specific site of bleeding, diagnosing active hemorrhage, and controlling the airway in patients with catastrophic hemorrhage. However, its capacity to help localize the site of bleeding is equivalent to that of radiography or CT, and it is less useful in detecting an underlying disease process. The airways are often filled with blood at the time of bronchoscopy, making evaluation of the distal airways difficult.

Several articles have cited cases of hemoptysis with negative chest radiograph and bronchoscopy in which CT subsequently showed malignancies. In addition, CT can establish the diagnosis of bronchiectasis. Refer to the original guideline document for a brief review of some of the pertinent studies along with their conclusions.

Guidelines

Several articles have addressed the need for further evaluation of patients with negative or nonlocalizing chest radiographs. The overall diagnostic yield in this category of patients is low. However, there is a well-recognized 3% to 10% incidence of malignancy in this population. One study reported that almost one-quarter of patients presenting with acute hemoptysis secondary to malignancy had normal chest radiographic findings, yet clear guidelines for the initial workup and follow-up in patients without a definitive diagnosis are lacking.

In the past, papers addressing the evaluation of hemoptysis among patients with normal chest radiographs focused on finding a means to minimize the performance of diagnostic bronchoscopy. Most of these studies were performed before chest CT was available or when chest CT image quality was limited by thick-slice sections and slow acquisition times.

For example, a study of 196 patients with negative chest radiographs and subsequent bronchoscopy found by univariate and discriminant analysis three predictors of malignancy. These risk factors included sex (male), age ≥50 years, and >40 pack-year smoking history. In that population, all cancers detected by bronchoscopy occurred in patients with 2 or 3 risk factors or with hemoptysis in excess of 30 mL over 24 hours (n=12). The positive predictive value of these criteria was 26%, capable of reducing rates of bronchoscopy only slightly. More importantly, long-term follow-up

(averaging 2 years) illustrated the limited sensitivity of bronchoscopy; 2 patients with negative bronchoscopy later presented with bronchogenic carcinoma.

Another study also evaluated patients (n=119) with hemoptysis and negative or nonlocalizing findings on chest radiographs, finding a total of 6 neoplasms (5%). Patients with normal chest radiograph did not differ from patients with nonlocalizing radiographic abnormalities with respect to the prevalence of cancer or the diagnostic yield of bronchoscopy. The authors proposed that patients older than 40 (rather than 50) be considered for bronchoscopy since 2 of 6 neoplasms would have been missed by the higher age threshold. Although the authors endorsed the selection criteria set forth by the first study (mentioned above), male gender was not a statistically significant predictor in their data. In the United States the current annual diagnosis rate of lung cancer is approximately 80 for every 100,000 men and 55 for every 100,000 women.

Another study may be the study most relevant to current practice. In that study, researchers retrospectively investigated 270 patients who had a history of smoking and presented with hemoptysis. Ninety percent of patients were ≥40 years of age, and 90% were current or ex-smokers. Twenty-six of those patients were ultimately found to have malignancy, 24 of them detected via CT. Notably, 13 (50%) of patients with cancer had only reported streaks of hemoptysis and had had only one or 2 episodes. Additionally, tobacco use averaged 38 pack-years in these patients, suggesting that smoking exposures <40 pack-years may represent a significant risk factor for respiratory malignancy in the setting of hemoptysis. This assessment is consistent with the National Lung Screening Trial, in which investigators screened patients with a >30 pack-year smoking history for lung cancer.

Viewed in the aggregate, these studies suggest that CT imaging of patients with hemoptysis who are >40 years old and have a smoking history would detect neoplasms in 5% to 10% of patients and exceed the yield from bronchoscopy. Diagnostic decision-making for patients who fall outside of this demographic group is more difficult and probably should be informed by the quantity of hemoptysis, its recurrence, and the presence of underlying disease. The observation that most patients with hemoptysis due to carcinoma experience only small-volume hemoptysis makes this task difficult.

Retrospective studies suggest that clinical outcome is favorable among patients with hemoptysis in whom malignancy is not found at initial evaluation. One study reported that smokers >40 years old whose initial diagnostic evaluation for hemoptysis is negative have an approximately 6% chance of manifesting lung cancer within 3 years. In this study all patients underwent bronchoscopy, but only selected patients underwent CT scanning. Another group of authors studied patients with hemoptysis who underwent both a negative bronchoscopic examination and a negative CT, finding no lung cancers during a mean follow-up period >2 years. Despite this data, in clinical practice it may be necessary to perform follow-up CT several months after the episode of hemoptysis to study the evolution of underlying parenchymal lung abnormalities or to exclude the possibility that a small malignancy may have been missed at initial CT.

Imaging

The imaging modalities pertinent to the evaluation of hemoptysis include chest radiograph, CT, multidetector CT (MDCT), and thoracic aortography-bronchial artery embolization. There is uniform recognition of the efficacy of chest radiograph in the initial stages of evaluation. Radiography can help lateralize the bleeding with a high degree of certainty and can often help detect underlying parenchymal and pleural abnormalities.

Bronchitis, bronchiectasis, and lung malignancies are the most common causes of hemoptysis and, although the first of the 3 requires endoscopic evaluation, the latter 2 are readily diagnosed by CT without intravenous contrast. CT is also effective in the diagnosis of less common causes of hemoptysis such as tuberculosis and chronic fungal infection. MDCT angiography can identify etiologies of hemoptysis that are nondetectable on noncontrast CT (such as Dieulafoy vascular anomalies) and can guide therapy when treatment is warranted.

MDCT angiography is most widely used in the setting of major or massive hemoptysis because it permits rapid, noninvasive, and accurate assessment of the cause and consequences of hemorrhage into the airways and helps guide subsequent management. Contrast-enhanced MDCT can demonstrate the site of bleeding as accurately as bronchoscopy and detect underlying disease with high sensitivity. A group of researchers showed that in 22 patients with hemoptysis, a 16-slice MDCT scanner detected all 31 bronchial arteries (100%) and 16 (62%) of 26 nonbronchial systemic arteries causing hemoptysis. Another research group evaluated 214 patients with hemoptysis on 4-, 16-, and 64-detector CT scanners and detected the presence of ectopic bronchial vessels in 36% of patients. MDCT provides high-resolution angiographic studies of the thoracic and upper abdominal vasculature, which are useful prior to anticipated bronchial artery embolization or surgical intervention. Despite these advantages, in the setting of massive hemoptysis from a known etiology (e.g., cystic fibrosis) some clinicians prefer the patient be taken directly for embolization without prior MDCT.

Bronchial Arteriography and Embolization

Bronchial artery arteriography is generally reserved for cases in which embolization is planned. Bronchial embolization has been shown to be an effective therapy for controlling massive hemoptysis from a large spectrum of causes, including tuberculosis, bronchiectasis, bronchogenic

carcinoma, aspergilloma, and bronchial inflammation. Transcatheter embolization for hemoptysis may serve as interim management before surgery or may constitute definitive therapy. Embolization is very effective in controlling acute hemorrhage caused by both benign and neoplastic etiologies. Rates of successful treatment, particularly in elderly patients, may be increased by the use of MDCT prior to embolization. Success rate is lowest in patients with aspergillomas, and a greater percentage of patients with hemoptysis from aspergillomas may require surgical treatment. Despite initial treatment success recurrence of hemoptysis during long-term follow-up is common, reported rates range between 5% and 45%. This may be improved by newer embolic agents. In more than 90% of cases of hemoptysis requiring intervention with arterial embolization or surgery, the bronchial arteries are responsible for the bleeding. Blood supply from nonbronchial systemic arteries, however, is not rare, and failure to recognize the presence of blood supply from these arteries in patients with massive hemoptysis may result in recurrent bleeding after successful bronchial artery embolization.

Peripheral pulmonary artery pseudoaneurysms occur in up to 11% of patients undergoing bronchial angiography for hemoptysis. In these patients successful treatment for hemoptysis may require pulmonary artery branches supplying the pseudoaneurysms as well as embolization of bronchial or nonbronchial systemic arteries.

Unless airway management is needed, bronchoscopy before bronchial artery embolization is not necessary in patients in whom the etiology of hemoptysis is known and for whom radiographs or CT have identified the site of bleeding. If airway management is needed, initial rigid bronchoscopy should be considered if individuals well trained in the technique are available.

Summary

- Initial evaluation of patients with hemoptysis should include a chest radiograph.
- In patients who are at high risk for malignancy and have suspicious chest radiograph findings, CT is suggested for initial evaluation. CT should also be considered in patients with risk factors (>40 years of age, >30 pack-year smoking history) despite a negative or nonlocalizing chest radiograph.
- Patients with negative chest radiograph, CT scan, and bronchoscopy (cryptogenic hemoptysis) have a low risk of malignancy and can be observed for the following 3 years. No specific recommendations regarding chest CT or radiography during that interval can be made, but imaging should be based on patients' risk factors. If hemoptysis recurs MDCT angiography should be considered. Bronchoscopy may also complement imaging during the period of observation.
- Massive hemoptysis can be effectively treated with either surgery or transcatheter embolization. Contrast-enhanced MDCT prior to embolization or surgery can define the source of hemoptysis as bronchial systemic, nonbronchial systemic, and/or pulmonary arterial. Transcatheter embolization is usually successful in halting acute hemorrhage, but patients frequently need to be retreated for recurrent hemorrhage during long-term follow-up.

Abbreviations

- CT, computed tomography
- CTA, computed tomography angiography

Relative Radiation Level Designations

Relative Radiation Level*	Adult Effective Dose Estimate Range	Pediatric Effective Dose Estimate Range
O	0 mSv	0 mSv
	<0.1 mSv	<0.03 mSv
	0.1-1 mSv	0.03-0.3 mSv
	1-10 mSv	0.3-3 mSv
	10-30 mSv	3-10 mSv
	30-100 mSv	10-30 mSv
*RRL assignments for some of the examinations cannot be made, because the actual patient doses in these procedures vary as a function of a number of factors (e.g., region of the body exposed to ionizing radiation, the imaging guidance that is used). The RRLs for these examinations are designated as "Varies."		

Clinical Algorithm(s)

Algorithms were not developed from criteria guidelines.

Scope

Disease/Condition(s)

Hemoptysis

Guideline Category

Diagnosis

Evaluation

Treatment

Clinical Specialty

Emergency Medicine

Family Practice

Internal Medicine

Pulmonary Medicine

Radiology

Intended Users

Health Plans

Hospitals

Managed Care Organizations

Physicians

Utilization Management

Guideline Objective(s)

To evaluate the appropriateness of initial radiologic examinations for patients with hemoptysis

Target Population

Patients with hemoptysis

Interventions and Practices Considered

1. X-ray chest

2. Computed tomography (CT) chest without contrast
3. Computed tomography angiography (CTA) chest with contrast
4. Pulmonary arteriography
5. Arteriography
    - Pulmonary
    - Bronchial with or without embolization

Major Outcomes Considered

- Utility of radiologic examinations in differential diagnosis
- Sensitivity, specificity, positive predictive value, negative predictive value, and accuracy of radiologic examinations
- Efficacy of arterial embolization for hemoptysis

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Literature Search Procedure

Staff search in PubMed only for peer reviewed medical literature for routine searches. Any article or guideline may be used by the author in the narrative but those materials may have been identified outside of the routine literature search process.

The Medline literature search is based on keywords provided by the topic author. The two general classes of keywords are those related to the condition (e.g., ankle pain, fever) and those that describe the diagnostic or therapeutic intervention of interest (e.g., mammography, MRI).

The search terms and parameters are manipulated to produce the most relevant, current evidence to address the American College of Radiology Appropriateness Criteria (ACR AC) topic being reviewed or developed. Combining the clinical conditions and diagnostic modalities or therapeutic procedures narrows the search to be relevant to the topic. Exploding the term "diagnostic imaging" captures relevant results for diagnostic topics.

The following criteria/limits are used in the searches.

1. Articles that have abstracts available and are concerned with humans.
2. Restrict the search to the year prior to the last topic update or in some cases the author of the topic may specify which year range to use in the search. For new topics, the year range is restricted to the last 10 years unless the topic author provides other instructions.
3. May restrict the search to Adults only or Pediatrics only.
4. Articles consisting of only summaries or case reports are often excluded from final results.

The search strategy may be revised to improve the output as needed.

Number of Source Documents

The total number of source documents identified as the result of the literature search is not known.

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Study Quality Category Definitions

Category 1 - The study is well-designed and accounts for common biases.

Category 2 - The study is moderately well-designed and accounts for most common biases.

Category 3 - There are important study design limitations.

Category 4 - The study is not useful as primary evidence. The article may not be a clinical study or the study design is invalid, or conclusions are based on expert consensus. For example:

a. The study does not meet the criteria for or is not a hypothesis-based clinical study (e.g., a book chapter or case report or case series description).
b. The study may synthesize and draw conclusions about several studies such as a literature review article or book chapter but is not primary evidence.
c. The study is an expert opinion or consensus document.

Methods Used to Analyze the Evidence

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

The topic author drafts or revises the narrative text summarizing the evidence found in the literature. American College of Radiology (ACR) staff draft an evidence table based on the analysis of the selected literature. These tables rate the strength of the evidence (study quality) for each article included in the narrative text.

The expert panel reviews the narrative text, evidence table, and the supporting literature for each of the topic-variant combinations and assigns an appropriateness rating for each procedure listed in the table. Each individual panel member assigns a rating based on his/her interpretation of the available evidence.

More information about the evidence table development process can be found in the ACR Appropriateness Criteria® Evidence Table Development document (see the "Availability of Companion Documents" field).

Methods Used to Formulate the Recommendations

Expert Consensus (Delphi)

Description of Methods Used to Formulate the Recommendations

Rating Appropriateness

The appropriateness ratings for each of the procedures included in the Appropriateness Criteria topics are determined using a modified Delphi methodology. A series of surveys are conducted to elicit each panelist's expert interpretation of the evidence, based on the available data, regarding the appropriateness of an imaging or therapeutic procedure for a specific clinical scenario. American College of Radiology (ACR) staff distribute surveys to the panelists along with the evidence table and narrative. Each panelist interprets the available evidence and rates each procedure. The surveys are completed by panelists without consulting other panelists. The appropriateness rating scale is an ordinal scale that uses integers from 1 to 9 grouped into three categories: 1, 2, or 3 are in the category "usually not appropriate"; 4, 5, or 6 are in the category "may be appropriate"; and 7, 8, or 9 are in the category "usually appropriate." Each panel member assigns one rating for each procedure for a clinical scenario. The ratings assigned by each panel member are presented in a table displaying the frequency distribution of the ratings without identifying which members provided any particular rating.

If consensus is reached, the median rating is assigned as the panel's final recommendation/rating. Consensus is defined as eighty percent (80%)

agreement within a rating category. A maximum of three rounds may be conducted to reach consensus. Consensus among the panel members must be achieved to determine the final rating for each procedure.

If consensus is not reached, the panel is convened by conference call. The strengths and weaknesses of each imaging procedure that has not reached consensus are discussed and a final rating is proposed. If the panelists on the call agree, the rating is proposed as the panel's consensus. The document is circulated to all the panelists to make the final determination. If consensus cannot be reached on the call or when the document is circulated, "No consensus" appears in the rating column and the reasons for this decision are added to the comment sections.

This modified Delphi method enables each panelist to express individual interpretations of the evidence and his or her expert opinion without excessive influence from fellow panelists in a simple, standardized and economical process. A more detailed explanation of the complete process can be found in additional methodology documents found on the ACR Web site (see also the "Availability of Companion Documents" field).

Rating Scheme for the Strength of the Recommendations

Not applicable

Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

Internal Peer Review

Description of Method of Guideline Validation

Criteria developed by the Expert Panels are reviewed by the American College of Radiology (ACR) Committee on Appropriateness Criteria.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The recommendations are based on analysis of the current literature and expert panel consensus.

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Selection of appropriate radiologic imaging procedures for the evaluation of patients with hemoptysis

Potential Harms

Relative Radiation Level

Potential adverse health effects associated with radiation exposure are an important factor to consider when selecting the appropriate imaging procedure. Because there is a wide range of radiation exposures associated with different diagnostic procedures, a relative radiation level (RRL) indication has been included for each imaging examination. The RRLs are based on effective dose, which is a radiation dose quantity that is used to estimate population total radiation risk associated with an imaging procedure. Patients in the pediatric age group are at inherently higher risk from

exposure, both because of organ sensitivity and longer life expectancy (relevant to the long latency that appears to accompany radiation exposure). For these reasons, the RRL dose estimate ranges for pediatric examinations are lower as compared to those specified for adults. Additional information regarding radiation dose assessment for imaging examinations can be found in the American College of Radiology (ACR) Appropriateness Criteria® Radiation Dose Assessment Introduction document (see the "Availability of Companion Documents" field).

Qualifying Statements

Qualifying Statements

The American College of Radiology (ACR) Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists, and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those examinations generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the U.S. Food and Drug Administration (FDA) have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

IOM Domain

Effectiveness

Identifying Information and Availability

Bibliographic Source(s)

Ketai LH, Kirsch J, Kanne JP, Chung JH, Donnelly EF, Ginsburg ME, Heitkamp DE, Henry TS, Kazerooni EA, Lorenz JM, McComb BL, Ravenel JG, Saleh AG, Shah RD, Steiner RM, Suh RD, Mohammed TLH, Expert Panel on Thoracic Imaging. ACR Appropriateness CriteriaÂ® hemoptysis [online publication]. Reston (VA): American College of Radiology (ACR); 2014. 7 p. [32 references]

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

1995 (revised 2014)

Guideline Developer(s)

American College of Radiology - Medical Specialty Society

Source(s) of Funding

The American College of Radiology (ACR) provided the funding and the resources for these ACR Appropriateness Criteria®.

Guideline Committee

Committee on Appropriateness Criteria, Expert Panel on Thoracic Imaging

Composition of Group That Authored the Guideline

Panel Members: Loren H. Ketai, MD (*Principal Author*); Jacobo Kirsch, MD (*Panel Vice-chair*); Jeffrey P. Kanne, MD (*Panel Vice-chair*); Jonathan H. Chung, MD; Edwin F. Donnelly, MD; Mark E. Ginsburg, MD; Darel E. Heitkamp, MD; Travis S. Henry, MD; Ella A. Kazerooni, MD; Jonathan M. Lorenz, MD (*Panel Vice-chair*); Barbara L. McComb, MD; James G. Ravenel, MD Anthony G. Saleh, MD; Rakesh D. Shah, MD; Robert M. Steiner, MD; Robert D. Suh, MD; Tan-Lucien H. Mohammed, MD (*Panel Chair*)

Financial Disclosures/Conflicts of Interest

Not stated

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Jeudy J, Khan AR, Mohammed TL, Amorosa JK, Brown K, Dyer DS, Gurney JW, MacMahon H, Saleh AG, Vydareny KH, Expert Panel on Thoracic Imaging. ACR Appropriateness Criteria® hemoptysis. [online publication]. Reston (VA): American College of Radiology (ACR); 2010. 5 p. [21 references]

Guideline Availability

Electronic copies: Available from the American College of Radiology (ACR) Web site .

Print copies: Available from the American College of Radiology, 1891 Preston White Drive, Reston, VA 20191. Telephone: (703) 648-8900.

Availability of Companion Documents

The following are available:

- ACR Appropriateness Criteria®. Overview. Reston (VA): American College of Radiology; 2013 Nov. 3 p. Electronic copies: Available

from the American College of Radiology (ACR) Web site.

- ACR Appropriateness Criteria®. Literature search process. Reston (VA): American College of Radiology; 2013 Apr. 1 p. Electronic copies: Available from the ACR Web site.
- ACR Appropriateness Criteria®. Evidence table development – diagnostic studies. Reston (VA): American College of Radiology; 2013 Nov. 3 p. Electronic copies: Available from the ACR Web site.
- ACR Appropriateness Criteria®. Evidence table development – therapeutic studies. Reston (VA): American College of Radiology; 2013 Nov. 4 p. Electronic copies: Available from the ACR Web site.
- ACR Appropriateness Criteria®. Radiation dose assessment introduction. Reston (VA): American College of Radiology; 2103 Nov. 3 p. Electronic copies: Available from the ACR Web site.
- ACR Appropriateness Criteria®. Manual on contrast media. Reston (VA): American College of Radiology; 90 p. Electronic copies: Available from the ACR Web site.
- ACR Appropriateness Criteria®. Procedure information. Reston (VA): American College of Radiology; 1 p. Electronic copies: Available from the ACR Web site.
- ACR Appropriateness Criteria® hemoptysis. Evidence table. Reston (VA): American College of Radiology; 2014. 14 p. Electronic copies: Available from the ACR Web site.

Patient Resources

None available

NGC Status

This NGC summary was completed by ECRI Institute on April 27, 2007. This NGC summary was updated by ECRI Institute on December 17, 2010 and July 31, 2014.

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